

ANTHELMINTIC TREATMENT OF GOATS ON AN ARID RANGE AND ITS EFFECT ON MILK PRODUCTION EARLY IN LACTATION

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ABSTRACT

The effect of a single anthelmintic treatment at the beginning of lactation on milk production and composition, live weight change and blood chemistry in mix-breeds goats was studied in an arid zone of northern Mexico. Ten adult goats were treated with Closantel® subcutaneously at 8.0 mg kg⁻¹ BW. Eleven adult goats were used as untreated controls. The overall total trial reduction in fecal egg counts due to anthelmintic treatment was 96%, but this fecal egg counts reduction did not affect liveweight change (-13 ±

0.5 and -15 ± 0.3 g d⁻¹ for treated and control does), milk yield (30.7 ± 0.4 and 33.6 ± 0.8 L in 73 days of lactation for treated and control does). No significant differences were seen in milk composition and blood profiles between treated and untreated goats. It was concluded that, in the present context of goat exploitation under traditional extensive village system in an arid environment, parasite burdens at the beginning of lactation were not sufficiently severe to affect milk production and weight change of goats.

KEY WORDS: Anthelmintic treatment, blood chemistry, body weight, goats, milk production, gastrointestinal nematodes.

RESUMEN

TRATAMIENTO ANTHELMÍNTICO DE CABRAS EN REGIÓN ÁRIDA Y SU EFECTO SOBRE LA PRODUCCIÓN DE LECHE EN LA FASE INICIAL DE LA LACTACIÓN

Se estudió el efecto de la desparasitación gastrointestinal al inicio de la lactancia sobre la producción y composición de la leche, cambio de peso y metabolitos sanguíneos de cabras en una zona árida del norte de México. Diez cabras adultas de raza indefinida fueron tratadas con Closantel® subcutáneamente, con una dosis de 8.0 mg kg⁻¹ peso vivo. El grupo testigo estuvo constituido por 11 cabras no tratadas. La reducción de huevos en las heces en los animales tratados fue de 96%, pero esta reducción no afectó los cambios de peso (-13 ± 0.5 y -15 ± 0.3 g d⁻¹ para las cabras tratadas y el grupo testigo), producción de leche

(30.7 ± 0.4 y 33.6 ± 0.8 L en 73 días de lactancia para cabras tratadas y testigo). No se detectaron diferencias entre grupos de cabras en cuanto a composición de la leche y niveles de algunos metabolitos y minerales de la sangre. Se concluyó que, en el presente contexto de explotación caprina bajo sistemas extensivos tradicionales en las zonas áridas del norte de México, el nivel de parasitismo gastrointestinal al inicio de la lactancia no fue lo suficientemente severo para influir en la producción de leche y cambio de peso de las cabras.

KEY WORDS: Anthelmintic treatment, blood chemistry, gastrointestinal nematodes, goats, milk production.

RESUMO

TRATAMENTO ANTHELMÍNTICO DE CABRAS NA REGIÃO ÁRIDA E SEU EFEITO SOBRE A PRODUÇÃO DE LEITE NA FASE INICIAL DA LACTAÇÃO

Foi estudado o efeito da desparasitação gastrointestinal, no início da lactação, sobre a produção e

composição do leite, mudança de peso corporal e metabolitos sanguíneos de cabras numa zona árida do norte do México.

Dez cabras adultas foram tratadas com Closantel® subcutaneamente, com dose de 8,0 mg/Kg de peso vivo. O grupo-controle foi constituído por onze cabras não tratadas. A redução do número de ovos nas fezes nos animais tratados foi de 96%, no entanto, resultado não significativamente diferente entre grupos tratado *versus* grupo-controle, sobre valores para mudança de peso ($-13 \pm 0,5$ e $-15 \pm 0,3$ g/dia) e produção de leite ($30,7 \pm 0,4$ e $33,6 \pm 0,8$) em 73 dias de lactação, nos grupos tratado e controle, respectivamente.

PALAVRAS CHAVE: Antihelmíntico, cabras, metabolitos sanguíneos, parasitas gastrointestinais, produção de leite.

INTRODUCTION

Commercial goat dairying in Mexico is carried out basically in pastoralist systems in arid and semiarid zones. Goats under these extensive village systems have minimum sanitation procedures, thus programs to control parasite burden is not a common health practice. Little is known about the impact of helminthiasis on goat milk production under resource-poor conditions ecosystems. In dairy goats in temperate areas under experimental (HOSTE & CHARTIER, 1993; CHARTIER & HOSTE, 1997, 1998) and natural (HOSTE et al., 1999; CHARTIER et al., 2000) conditions, a lower resistance and/or resilience to nematode infection has been observed in high producing dairy goats compared to low producing ones. A reduction in milk yield has been documented in dairy goats with gastrointestinal parasitism (HOSTE & CHARTIER, 1998; ETTER et al., 2000). In contrast to the broad range of studies in dairy goats in non-arid environments, there are few studies on the effects of endoparasites on dairy goats in xeric environments. Therefore the objective of this study was to evaluate the effect of an anthelmintic treatment on milk production in early lactation, live weight change and blood chemistry of goats on rangeland.

MATERIALS AND METHODS

The study was carried out in a pastoralist settlement in northeast Mexico ($25^{\circ} 14' N$, and $101^{\circ} 10' W$). The climate is semiarid with an annual precipitation averaging 320 mm. Seventy percentage of the total annual precipitation falls between June and October. The average annual temperature for the

Não houve diferenças significativas entre ambos os grupos, na composição do leite e teores de alguns metabólitos e minerais do sangue. Conclui-se que, no presente contexto de exploração caprina, sob sistemas extensivos tradicionais nas zonas áridas do norte do México, o nível de parasitismo gastrointestinal no início da lactação não foi severo o suficiente para influenciar a produção de leite e a mudança de peso corporal das cabras.

study area is $18.2^{\circ} C$ and mean elevation is 1700 m. The study area vegetation is characterized as Chihuahan desert rangeland.

Lactating multiparous goats of undefined genotype (mixture of Criollo, Granadino, Nubian and dairy breeds) and low milk production potential (approximately 80 L in 6-month lactations) were used. Goats foraged exclusively on native vegetation guided by a herdsman, during approximately eight hours daily (from 10 A.M. to 6 P.M), and spent the night in an unroofed pen made of branches. Goats did not receive feed supplement and had no health intervention. The kidding period was in early July 2000, therefore the lactation period took place during Summer and Autumn, and goats were not exposed to bucks during lactation.

Twenty-one multiparous goats were selected at parturition (early July) based on similar size and weight, and divided at random either to anthelmintic treatment (Closantel®; subcutaneously at $8.0 \text{ mg kg}^{-1} \text{ BW}$; $n= 10$) or no treatment ($n= 11$). All goats were routinely milked by hand once daily in the morning, during 73 d, after over-night separation from kids. Milk yield was recorded every 21 d with a graduated container, and aliquots were collected to measure concentration of fat (Gerber method; EGAN et al., 1981) and protein (EGAN et al., 1981).

Fresh fecal samples were collected directly from the rectum at three-week intervals from all does. Gastrointestinal nematode egg counts were made by means of the modified McMaster method (STAFFORD et al., 1994). Goats were weighed at the beginning of the trial and subsequently at 21 d intervals. At the end of the trial, blood (5 ml) was collected from the jugular vein, in the morning before grazing (14-16 h from the last feeding). Serum was

separated and stored at -20°C for subsequent determination of concentration of glucose, urea, total proteins, cholesterol, phosphorus, calcium, copper, magnesium and zinc. All blood metabolites analyses were carried out with a spectrophotometer (Coleman Junior II). All minerals, except phosphorus, were determined by atomic absorption spectrophotometry. Phosphorus was determined by the method of Fiske and Subbarow (1925).

Nematode eggs per gram (EPG) of feces were transformed to $\log_{10}(x + 1)$. Analyses involving changes in EPG, live weight change, milk production and milk composition over time were performed by analyses of variance for repeated measurements (time by treatment model), using procedures of SAS (1988) with anthelmintic treatment being the main factor. Back-transformed data are presented in the results section. The effect of anthelmintic treatment on blood metabolites and minerals was analyzed using Student t-test (Steel and Torrie, 1980).

RESULTS

For both treated and untreated goats, egg excretion was high at the beginning of lactation (around 2,000 EPG), and in the untreated animals it rose from July onwards and reached a high level in early

September (around 4,000 EPG; Fig. 1). The fecal egg counts for treated goats were reduced ($P < 0.05$) at each post-treatment sampling period. The overall total trial reduction in EPG due to closantel treatment was 96%. During the first 73 days of lactation a continuous weight loss of the controls and treated animals was observed (Table 1).

There was no effect of anthelmintic treatment on total milk yield during the first half of lactation (Table 1). Also, fat and protein content were not altered by the anthelmintic treatment. Closantel treatment did not influence serum metabolites and minerals ten weeks following treatment (Table 2).

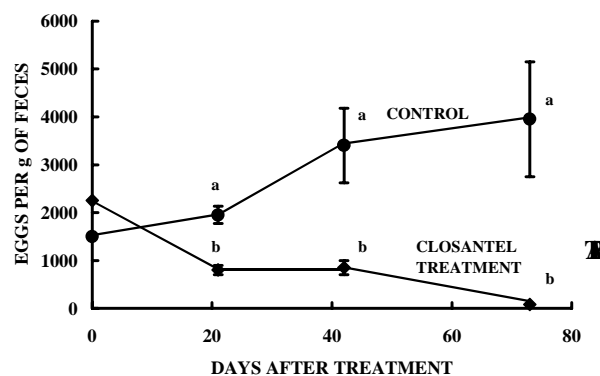


FIGURA 1. Mean \pm standard deviation of Nematode EPG for treated and untreated goats under range conditions during the first half of lactation. Different letters within each period after treatment indicate significant difference at $P < 0.05$.

TABLE 1. Mean \pm standard error of the mean of body weight change, milk production, fat and protein content of goats on range conditions treated with closantel at the onset of lactation.

Variables*	Anthelmintic treatment †	Control
Body weight change (g d^{-1})	-13 ± 0.5	-15 ± 0.3
Milk production in 73 days (L)	30.7 ± 0.4	33.6 ± 0.8
Fat (g L^{-1}) in 73 d lactation	45 ± 0.3	45 ± 0.7
Protein (g L^{-1}) in 73 d lactation	25 ± 0.1	26 ± 0.2

*For all variables no significant differences were detected.

†Closantel

TABLE 2. Mean \pm standard error of the mean of some metabolites and minerals in blood serum from lactating goats on range conditions treated or untreated with anthelmintics at the onset of lactation

Variables*	Anthelmintic treatment †	Control
Glucose (mg 100 ml ⁻¹)	54.9 \pm 0.9	54.0 \pm 1.3
Urea (mg 100 ml ⁻¹)	12.6 \pm 0.1	12.4 \pm 0.1
Creatinine (mg 100 ml ⁻¹)	0.76 \pm 0.2	0.73 \pm 0.2
Uric acid (mg 100 ml ⁻¹)	4.3 \pm 0.1	4.3 \pm 0.3
Cholesterol (mg 100 ml ⁻¹)	79.0 \pm 3.4	86.7 \pm 3.7
Total proteins (g 100 ml ⁻¹)	6.7 \pm 0.05	6.9 \pm 0.1
Phosphorus (mg 100 ml ⁻¹)	7.0 \pm 0.1	6.4 \pm 0.1
Calcium (mg 100 ml ⁻¹)	11.0 \pm 0.5	11.1 \pm 0.3
Magnesium (mg 100 ml ⁻¹)	2.8 \pm 0.05	2.7 \pm 0.1
Copper (ppm)	1.09 \pm 0.02	1.10 \pm 0.03
Zinc (ppm)	2.8 \pm 0.02	2.8 \pm 0.07

*For all variables no significant differences were detected.

†Closantel

DISCUSSION

These results demonstrated that closantel treatment at the beginning of lactation did not have a beneficial effect on goat milk yield, weight change and blood chemistry. The lack of response in zootechnical performance in the treated goats and the absence of external signs of helminthosis in the untreated animals, suggest an expression of resilience of the host against nematode infection. Goat production under pastoral systems in arid areas of Mexico has been carried out for centuries, therefore the development of host resistance to endoparasites infections is likely in this environment. The low milk production potential of goats in this ecosystem is probably one of the adaptative process to counterbalance the detrimental effects of gastrointestinal parasitism. HOSTE & CHARTIER (1993), HOSTE et al. (1995) and CHARTIER & HOSTE (1998) have shown that the impact of nematode parasitism of the digestive tract on goat milk production is less severe in low producing does. Also, under natural conditions, CHARTIER et al. (2000) and HOSTE et al. (2002) have reported that high milk producing goats are less resistant to nematode infections. Additional field studies (CHARTIER & HOSTE, 1994; HOSTE et al.,

1999) indicate that anthelmintic treatments induce a more pronounced response in milk production for high-producing animals compared to low-producing ones. Under intensive conditions and regardless of level of milk production, milk yield of highly parasitized dairy goats (HOSTE & CHARTIER, 1993; HOSTE et al., 2001) and dairy sheep (GARCÍA-PÉREZ, 2002) has not been affected when compared with animals free of strongyle infections.

In the present study no effect of treatment at the beginning of lactation was seen on milk composition. Studies assessing the effect of nematode infection on milk composition in cows (PLOEGER et al., 1989; NODTVEDT et al., 2002) and dairy goats (HOSTE & CHARTIER, 1993) have not indicated any change in fat and protein content. However, level of milk production seems to be an important factor for milk composition in dairy goats. In high producers, *T. colubriformis* induces a decreased fat and protein yield. In contrast, in the low producing does nematode infections do not alter milk composition (ETTER et al., 2000).

In the present study none of the blood components were affected by the anthelmintic treatment. These results disagree with observations of HOSTE & CHARTIER (1993) and CHARTIER et al. (2000). The lack of differences in serum

phosphorus and other metabolites between the treated and untreated does suggests that nematode parasitism apparently was not severe enough as to impair the nutritional status of the nematode-infected animals.

CONCLUSIONS

We conclude that in the present context of traditional goat production systems in the arid zones of northern Mexico, a single anthelmintic treatment at the beginning of lactation was effective in depressing excretion of nematode eggs; however, the parasitological impact was not reflected in liveweight change, milk yield, milk composition and of blood constituents. Thus, these data suggest a high resilience of mixed-breed goats against nematode infection in this nutrient-limiting environment.

ACKNOWLEDGEMENTS

Appreciation is extended to COECYT (grant number COAH-2002-C01-3753) for funding of this study.

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